

Mecklenburg County Common Code Defects

Electrical

Code Defects

Improper Over Current Protection

Code Description

310.15 Ampacities for Conductors Rated 0–2000 Volts.

(A) General.

(1) Tables or Engineering Supervision. Ampacities for conductors shall be permitted to be determined by tables or under engineering supervision, as provided in 310.15(B) and (C).

FPN No. 1: Ampacities provided by this section do not take voltage drop into consideration. See 210.19(A), FPN No. 4, for branch circuits and 215.2(D), FPN No. 2, for feeders.

FPN No. 2: For the allowable ampacities of Type MTW wire, see Table 11 in NFPA 79-1997, Electrical Standard for Industrial Machinery.

(2) Selection of Ampacity. Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 3.0 m (10 ft) or 10 percent of the circuit length figured at the higher ampacity, whichever is less.

FPN: See 110.14(C) for conductor temperature limitations due to termination provisions.

(B) Tables. Ampacities for conductors rated 0 to 2000 volts shall be as specified in the Allowable Ampacity Table 310.16 through Table 310.19 and Ampacity Table 310.20 through 310.23 as modified by (1) through (6).

FPN: Tables Table 310.16 through Table 310.19 are application tables for use in determining conductor sizes on loads calculated in accordance with Article 220. Allowable ampacities result from consideration of one or more of the following:

(1) Temperature compatibility with connected equipment, especially the connection points.

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- (2) Coordination with circuit and system overcurrent protection.
- (3) Compliance with the requirements of product listings or certifications. See 110.3(B).
- (4) Preservation of the safety benefits of established industry practices and standardized procedures.
- (1) **General.** For explanation of type letters used in tables and for recognized sizes of conductors for the various conductor insulations, see 310.13. For installation requirements, see 310.1 through 310.10 and the various articles of this Code. For flexible cords, see Table 400.4, Table 400.5(A), and Table 400.5(B).
- (2) Adjustment Factors.**
- (a) **More Than Three Current-Carrying Conductors in a Raceway or Cable.** Where the number of current-carrying conductors in a raceway or cable exceeds three, or where single conductors or multiconductor cables are stacked or bundled longer than 600 mm (24 in.) without maintaining spacing and are not installed in raceways, the allowable ampacity of each conductor shall be reduced as shown in Table 310.15(B)(2)(a).
FPN: See Annex B, Table B.310.11, for adjustment factors for more than three current-carrying conductors in a raceway or cable with load diversity.
- Exception No. 1:** Where conductors of different systems, as provided in 300.3, are installed in a common raceway or cable, the derating factors shown in Table 310.15(B)(2)(a) shall apply to the number of power and lighting conductors only (Articles 210, 215, 220, and 230).
- Exception No. 2:** For conductors installed in cable trays, the provisions of 392.11 shall apply.
- Exception No. 3:** Derating factors shall not apply to conductors in nipples having a length not exceeding 600 mm (24 in.).
- Exception No. 4:** Derating factors shall not apply to underground conductors entering or leaving an outdoor trench if those conductors have physical protection in the form of rigid metal conduit, intermediate metal conduit, or rigid nonmetallic conduit having a length not exceeding 3.05 m (10 ft) and if the number of conductors does not exceed four.
- Exception No. 5:** Adjustment factors shall not apply to Type AC cable or to Type MC cable without an overall outer jacket under the following conditions:

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- (a) Each cable has not more than three current-carrying conductors.
- (b) The conductors are 12 AWG copper.
- (c) Not more than 20 current-carrying conductors are bundled, stacked, or supported on "bridle rings." A 60 percent adjustment factor shall be applied where the current-carrying conductors in these cables that are stacked or bundled longer than 600 mm (24 in.) without maintaining spacing exceeds 20.

Table 310.15(B)(2)(a) Adjustment Factors for More Than Three Current-Carrying Conductors in a Raceway or Cable

Number of Current-Carrying Conductors	Percent of Values in Tables 310.16 through 310.19 as Adjusted for Ambient Temperature if Necessary
4–6	80
7–9	70
10–20	50
21–30	45
31–40	40
41 and above	35

- (b) More Than One Conduit, Tube, or Raceway. Spacing between conduits, tubing, or raceways shall be maintained.

(3) Bare or Covered Conductors. Where bare or covered conductors are used with insulated conductors, their allowable ampacities shall be limited to those permitted for the adjacent insulated conductors.

(4) Neutral Conductor.

- (a) A neutral conductor that carries only the unbalanced current from other conductors of the same circuit shall not be required to be counted when applying the provisions of 310.15(B)(2)(a).

- (b) In a 3-wire circuit consisting of two phase wires and the neutral of a 4-wire, 3-phase, wye-connected system, a common conductor carries approximately the same current as the line-to-neutral load currents of the other conductors and shall be counted when applying the provisions of 310.15(B)(2)(a).

- (c) On a 4-wire, 3-phase wye circuit where the major portion of the load consists of nonlinear loads, harmonic currents are present in the neutral conductor; the neutral shall therefore be considered a current-carrying conductor.

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(5) Grounding or Bonding Conductor. A grounding or bonding conductor shall not be counted when applying the provisions of 310.15(B)(2)(a).

(6) 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders. For dwelling units, conductors, as listed in Table 310.15(B)(6), shall be permitted as 120/240-volt, 3-wire, single-phase service-entrance conductors, service lateral conductors, and feeder conductors that serve as the main power feeder to a dwelling unit and are installed in raceway or cable with or without an equipment grounding conductor. For application of this section, the main power feeder shall be the feeder(s) between the main disconnect and the lighting and appliance branch-circuit panelboard(s). The feeder conductors to a dwelling unit shall not be required to be larger than their service-entrance conductors. The grounded conductor shall be permitted to be smaller than the ungrounded conductors, provided the requirements of 215.2, 220.22, and 230.42 are met.

Table 310.15(B)(6) Conductor Types and Sizes for 120/240-Volt, 3-Wire, Single-Phase Dwelling Services and Feeders

Conductor (AWG or kcmil)

Copper (Amperes)	Aluminum or Copper-Clad Aluminum	Service or Feeder Rating
4	2	100
3	1	110
2	1/0	125
1	2/0	150
1/0	3/0	175
2/0	4/0	200
3/0	250	225
4/0	300	250
250	350	300
350	500	350
400	600	400

(C) Engineering Supervision. Under engineering supervision, conductor ampacities shall be permitted to be calculated by means of the following general formula:

where:

TC = conductor temperature in degrees Celsius (°C)

TA = ambient temperature in degrees Celsius (°C)

TD = dielectric loss temperature rise

RDC = dc resistance of conductor at temperature TC

YC = component ac resistance resulting from skin effect and proximity effect

RCA = effective thermal resistance between conductor and surrounding ambient

FPN: See Annex B for examples of formula applications.

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Table 310.16 Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 60°C Through 90°C (140°F Through 194°F), Not More Than Three Current-Carrying Conductors in Raceway, Cable, or Earth (Directly Buried), Based on Ambient Temperature of 30°C (86°F)

Size AWG or kcmil Temperature Rating of Conductor (See Table 310.13.)

Size AWG or kcmil

60°C (140°F) 75°C (167°F) 90°C (194°F)	60°C (140°F) 75°C (167°F)	90°C (194°F)
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Types TW, UF	Types RHW, THHW, THW, THWN, XHHW, USE, ZW	Types
TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2,	THHW, THW, THWN, XHHW, USE	RHW, THHW, THW, THWN, XHHW-2, ZW-2
USE-2, XHH, XHHW, XHHW-2, ZW-2	Types TW, UF	Types TBS, SA, SIS, THHN, THHW,
COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2

18	—	—	14	—	—	—	—
16	—	—	18	—	—	—	—
14*	20	20	25	—	—	—	—
12*	25	25	30	20	20	25	12*
10*	30	35	40	25	30	35	10*
8	40	50	55	30	40	45	8
6	55	65	75	40	50	60	6
4	70	85	95	55	65	75	4
3	85	100	110	65	75	85	3
2	95	115	130	75	90	100	2
1	110	130	150	85	100	115	1
1/0	125	150	170	100	120	135	1/0
2/0	145	175	195	115	135	150	2/0
3/0	165	200	225	130	155	175	3/0
4/0	195	230	260	150	180	205	4/0
250	215	255	290	170	205	230	250
300	240	285	320	190	230	255	300
350	260	310	350	210	250	280	350
400	280	335	380	225	270	305	400
500	320	380	430	260	310	350	500
600	355	420	475	285	340	385	600
700	385	460	520	310	375	420	700
750	400	475	535	320	385	435	750
800	410	490	555	330	395	450	800
900	435	520	585	355	425	480	900
1000	455	545	615	375	445	500	1000
1250	495	590	665	405	485	545	1250
1500	520	625	705	435	520	585	1500
1750	545	650	735	455	545	615	1750
2000	560	665	750	470	560	630	2000

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CORRECTION FACTORS

Ambient Temp. (°C) For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below. Ambient Temp. (°F)

21–25	1.08	1.05	1.04	1.08	1.05	1.04	70–77
26–30	1.00	1.00	1.00	1.00	1.00	1.00	78–86
31–35	0.91	0.94	0.96	0.91	0.94	0.96	87–95
36–40	0.82	0.88	0.91	0.82	0.88	0.91	96–104
41–45	0.71	0.82	0.87	0.71	0.82	0.87	105–113
46–50	0.58	0.75	0.82	0.58	0.75	0.82	114–122
51–55	0.41	0.67	0.76	0.41	0.67	0.76	123–131
56–60	—	0.58	0.71	—	0.58	0.71	132–140
61–70	—	0.33	0.58	—	0.33	0.58	141–158
71–80	—	—	0.41	—	—	0.41	159–176

* See 240.4(D).

Table 310.17 Allowable Ampacities of Single-Insulated Conductors Rated 0 Through 2000 Volts in Free Air, Based on Ambient Air Temperature of 30°C (86°F)

Size AWG or kcmil	Temperature Rating of Conductor (See Table 310.13.)						
	Size AWG or kcmil		60°C (140°F)		75°C (167°F)		90°C (194°F)
Types TW, UF		Types RHW, THHW, THW, THWN, XHHW, ZW		Types TBS, SA, SIS, FEP, FEPB, MI, RHH, RHW-2, THHN, THHW, THW-2, THWN-2, USE-2, XHH, XHHW, XHHW-2, ZW-2		Types TW, UF	
THHH, THW, THWN, XHHW		Types RHW, THHW, THW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2		Types TBS, SA, SIS, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2		Types RHW, THHW, THW-2, USE-2, XHH, XHHW, XHHW-2, ZW-2	
COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	18	—	—	18	—	—
18	—	—	18	—	—	—	—
16	—	—	24	—	—	—	—
14*	25	30	35	—	—	—	—
12*	30	35	40	25	30	35	12*
10*	40	50	55	35	40	40	10*
8	60	70	80	45	55	60	8
6	80	95	105	60	75	80	6
4	105	125	140	80	100	110	4
3	120	145	165	95	115	130	3
2	140	170	190	110	135	150	2
1	165	195	220	130	155	175	1
1/0	195	230	260	150	180	205	1/0
2/0	225	265	300	175	210	235	2/0
3/0	260	310	350	200	240	275	3/0
4/0	300	360	405	235	280	315	4/0
250	340	405	455	265	315	355	250

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300	375	445	505	290	350	395	300
350	420	505	570	330	395	445	350
400	455	545	615	355	425	480	400
500	515	620	700	405	485	545	500
600	575	690	780	455	540	615	600
700	630	755	855	500	595	675	700
750	655	785	885	515	620	700	750
800	680	815	920	535	645	725	800
900	730	870	985	580	700	785	900
1000	780	935	1055	625	750	845	1000
1250	890	1065	1200	710	855	960	1250
1500	980	1175	1325	795	950	1075	1500
1750	1070	1280	1445	875	1050	1185	1750
2000	1155	1385	1560	960	1150	1335	2000

CORRECTION FACTORS

Ambient Temp. (°C) For ambient temperatures other than 30°C (86°F), multiply the allowable ampacities shown above by the appropriate factor shown below.

Ambient Temp. (°F)

21–25	1.08	1.05	1.04	1.08	1.05	1.04	70–77
26–30	1.00	1.00	1.00	1.00	1.00	1.00	78–86
31–35	0.91	0.94	0.96	0.91	0.94	0.96	87–95
36–40	0.82	0.88	0.91	0.82	0.88	0.91	96–104
41–45	0.71	0.82	0.87	0.71	0.82	0.87	105–113
46–50	0.58	0.75	0.82	0.58	0.75	0.82	114–122
51–55	0.41	0.67	0.76	0.41	0.67	0.76	123–131
56–60	—	0.58	0.71	—	0.58	0.71	132–140
61–70	—	0.33	0.58	—	0.33	0.58	141–158
71–80	—	—	0.41	—	—	0.41	159–176

* See 240.4(D).

Table 310.18 Allowable Ampacities of Insulated Conductors Rated 0 Through 2000 Volts, 150°C Through 250°C (302°F Through 482°F). Not More Than Three Current-Carrying Conductors in Raceway or Cable, Based on Ambient Air Temperature of 40°C (104°F)

Size AWG or kcmil Temperature Rating of Conductor (See Table 310.13.)

Size AWG or kcmil

150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)
Type Z	Types FEP, FEPB, PFA	Types PFAH, TFE	Type Z
COPPER	NICKEL OR NICKEL-COATED COPPER		ALUMINUM OR
COPPER-CLAD ALUMINUM			
14	34	36	14
12	43	45	12
10	55	60	10

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8	76	83	93	57	8
6	96	110	117	75	6
4	120	125	148	94	4
3	143	152	166	109	3
2	160	171	191	124	2
1	186	197	215	145	1
1/0	215	229	244	169	1/0
2/0	251	260	273	198	2/0
3/0	288	297	308	227	3/0
4/0	332	346	361	260	4/0

CORRECTION FACTORS

Ambient Temp. (°C) For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities shown above by the appropriate factor shown below.

Ambient Temp. (°F)					
41–50	0.95	0.97	0.98	0.95	105–122
51–60	0.90	0.94	0.95	0.90	123–140
61–70	0.85	0.90	0.93	0.85	141–158
71–80	0.80	0.87	0.90	0.80	159–176
81–90	0.74	0.83	0.87	0.74	177–194
91–100		0.67	0.79	0.85	0.67 195–212
101–120		0.52	0.71	0.79	0.52 213–248
121–140		0.30	0.61	0.72	0.30 249–284
141–160		—	0.50	0.65	— 285–320
161–180		—	0.35	0.58	— 321–356
181–200		—	—	0.49	— 357–392
201–225		—	—	0.35	— 393–437

Table 310.19 Allowable Ampacities of Single-Insulated Conductors, Rated 0 Through 2000 Volts, 150°C Through 250°C (302°F Through 482°F), in Free Air, Based on Ambient Air Temperature of 40°C (104°F)

Size AWG or kcmil Temperature Rating of Conductor (See Table 310.13.)

Size AWG or kcmil	150°C (302°F)	200°C (392°F)	250°C (482°F)	150°C (302°F)
Type Z	Types FEP, FEPB, PFA	Types PFAH, TFE	Type Z	
COPPER	NICKEL, OR NICKEL-COATED COPPER	COPPER	ALUMINUM OR	
COPPER-CLAD ALUMINUM				
14	46	54	59	— 14
12	60	68	78	47 12
10	80	90	107	63 10
8	106	124	142	83 8
6	155	165	205	112 6
4	190	220	278	148 4
3	214	252	327	170 3

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2	255	293	381	198	2
1	293	344	440	228	1
1/0	339	399	532	263	1/0
2/0	390	467	591	305	2/0
3/0	451	546	708	351	3/0
4/0	529	629	830	411	4/0

CORRECTION FACTORS

Ambient Temp. (°C) For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities shown above by the appropriate factor shown below.

Ambient Temp. (°F)

41–50	0.95	0.97	0.98	0.95	105–122
51–60	0.90	0.94	0.95	0.90	123–140
61–70	0.85	0.90	0.93	0.85	141–158
71–80	0.80	0.87	0.90	0.80	159–176
81–90	0.74	0.83	0.87	0.74	177–194
91–100		0.67	0.79	0.85	0.67 195–212
101–120		0.52	0.71	0.79	0.52 213–248
121–140		0.30	0.61	0.72	0.30 249–284
141–160		—	0.50	0.65	— 285–320
161–180		—	0.35	0.58	— 321–356
181–200		—	—	0.49	— 357–392
201–225		—	—	0.35	— 393–437

Table 310.20 Ampacities of Not More Than Three Single Insulated Conductors, Rated 0 Through 2000 Volts, Supported on a Messenger, Based on Ambient Air Temperature of 40°C (104°F)

Size AWG or kcmil Temperature Rating of Conductor (See Table 310.13.)

Size AWG or kcmil

75°C (167°F)	90°C (194°F)	75°C (167°F)	90°C (194°F)
Types RHW, THHW, THW, THWN, XHHW, ZW		Types MI, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHHW, XHHW-2, ZW-2	Types RH, THW, THWN, THHW, XHHW, Types THHN, THHW, RHH, XHHW, RHW-2, XHHW-2, THW-2, THWN-2, USE-2, ZW-2

Types RHW, THHW, THW, THWN, XHHW, ZW	Types MI, THHN, THHW, THW-2, THWN-2, RHH, RHW-2, USE-2, XHHW, XHHW-2, ZW-2	Types RH, THW, THWN, THHW, XHHW, Types THHN, THHW, RHH, XHHW, RHW-2, XHHW-2, THW-2, THWN-2, USE-2, ZW-2
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COPPER ALUMINUM OR COPPER-CLAD ALUMINUM

8	57	66	44	51	8
6	76	89	59	69	6
4	101	117	78	91	4
3	118	138	92	107	3
2	135	158	106	123	2
1	158	185	123	144	1
1/0	183	214	143	167	1/0
2/0	212	247	165	193	2/0
3/0	245	287	192	224	3/0
4/0	287	335	224	262	4/0

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250	320	374	251	292	250
300	359	419	282	328	300
350	397	464	312	364	350
400	430	503	339	395	400
500	496	580	392	458	500
600	553	647	440	514	600
700	610	714	488	570	700
750	638	747	512	598	750
800	660	773	532	622	800
900	704	826	572	669	900
1000	748	879	612	716	1000

CORRECTION FACTORS

Ambient Temp. (°C) For ambient temperatures other than 40°C (104°F), multiply the allowable ampacities shown above by the appropriate factor shown below. Ambient Temp. (°F)

21–25	1.20	1.14	1.20	1.14	70–77
26–30		1.13	1.10	1.13	1.10 79–86
31–35	1.07	1.05	1.07	1.05	88–95
36–40	1.00	1.00	1.00	1.00	97–104
41–45	0.93	0.95	0.93	0.95	106–113
46–50	0.85	0.89	0.85	0.89	115–122
51–55	0.76	0.84	0.76	0.84	124–131
56–60	0.65	0.77	0.65	0.77	133–140
61–70	0.38	0.63	0.38	0.63	142–158
71–80	—	0.45	—	0.45	160–176

Table 310.21 Ampacities of Bare or Covered Conductors in Free Air, Based on 40°C (104°F) Ambient, 80°C (176°F) Total Conductor Temperature, 610 mm/sec (2 ft/sec) Wind Velocity

Copper Conductors			AAC Aluminum Conductors		
Bare	Covered	AWG or kcmil	Bare	Covered	AWG or kcmil
AWG or kcmil	Amperes	AWG or kcmil	Amperes	AWG or kcmil	Amperes
AWG or kcmil	Amperes	AWG or kcmil	Amperes	AWG or kcmil	Amperes
8	98	8	103	8	76
6	124	6	130	6	96
4	155	4	163	4	121
2	209	2	219	2	163
1/0	282	1/0	297	1/0	220
2/0	329	2/0	344	2/0	255
3/0	382	3/0	401	3/0	297
4/0	444	4/0	466	4/0	346
250	494	250	519	266.8	403
300	556	300	584	336.4	468
					336.4 492

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500	773	500	812	397.5	522	397.5	548
750	1000	750	1050	477.0	588	477.0	617
1000	1193	1000	1253	556.5	650	556.5	682
—	—	—	—	636.0	709	636.0	744
—	—	—	—	795.0	819	795.0	860
—	—	—	—	954.0	920	—	—
—	—	—	—	1033.5	968	1033.5	
	1017						
—	—	—	—	1272	1103	1272	1201
—	—	—	—	1590	1267	1590	1381
—	—	—	—	2000	1454	2000	1527

310.60 Conductors Rated 2001 to 35,000 Volts.

(A) Definitions.

Electrical Ducts. As used in Article 310, electrical ducts shall include any of the electrical conduits recognized in Chapter 3 as suitable for use underground; other raceways round in cross section, listed for underground use, and embedded in earth or concrete.

Thermal Resistivity. As used in this Code, the heat transfer capability through a substance by conduction. It is the reciprocal of thermal conductivity and is designated Rho and expressed in the units °C-cm/watt.

(B) Ampacities of Conductors Rated 2001 to 35,000 Volts. Ampacities for solid dielectric-insulated conductors shall be permitted to be determined by tables or under engineering supervision, as provided in 310.60(C) and (D).

(1) Selection of Ampacity. Where more than one calculated or tabulated ampacity could apply for a given circuit length, the lowest value shall be used.

Exception: Where two different ampacities apply to adjacent portions of a circuit, the higher ampacity shall be permitted to be used beyond the point of transition, a distance equal to 3.0 m (10 ft) or 10 percent of the circuit length figured at the higher ampacity, whichever is less.

FPN: See 110.40 for conductor temperature limitations due to termination provisions.

(C) Tables. Ampacities for conductors rated 2001 to 35,000 volts shall be as specified in the Ampacity Table 310.67 through Table 310.86.

Ampacities at ambient temperatures other than those shown in the tables shall be determined by the formula in 310.60(C)(4).

FPN No. 1: For ampacities calculated in accordance with 310.60(B), reference IEEE 835-1994 (IPCEA Pub. No. P-46-426), Standard Power Cable Ampacity Tables, and the references therein for availability of all factors and constants.

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FPN No. 2: Ampacities provided by this section do not take voltage drop into consideration. See 210.19(A), FPN No. 4, for branch circuits and 215.2(D), FPN No. 2, for feeders.

(1) Grounded Shields. Ampacities shown in Table 310.69, Table 310.70, Table 310.81, and Table 310.82 are for cable with shields grounded at one point only. Where shields are grounded at more than one point, ampacities shall be adjusted to take into consideration the heating due to shield currents.

(2) Burial Depth of Underground Circuits. Where the burial depth of direct burial or electrical duct bank circuits is modified from the values shown in a figure or table, ampacities shall be permitted to be modified as indicated in (a) and (b).

(a) Where burial depths are increased in part(s) of an electrical duct run, no decrease in ampacity of the conductors is needed, provided the total length of parts of the duct run increased in depth is less than 25 percent of the total run length.

(b) Where burial depths are deeper than shown in a specific underground ampacity table or figure, an ampacity derating factor of 6 percent per 300-mm (1-ft) increase in depth for all values of rho shall be permitted.

No rating change is needed where the burial depth is decreased.

(3) Electrical Ducts in Figure 310.60. At locations where electrical ducts enter equipment enclosures from underground, spacing between such ducts, as shown in Figure 310.60, shall be permitted to be reduced without requiring the ampacity of conductors therein to be reduced.

Figure 310.60 Cable installation dimensions for use with Table 310.77 through Table 310.86.

(4) Ambients Not in Tables. Ampacities at ambient temperatures other than those shown in the tables shall be determined by means of the following formula:

where:

I₁= ampacity from tables at ambient TA₁

I₂= ampacity at desired ambient TA₂

TC = conductor temperature in degrees Celsius (°C)

TA₁= surrounding ambient from tables in degrees Celsius (°C)

TA₂= desired ambient in degrees Celsius (°C)

TD= dielectric loss temperature rise

(D) Engineering Supervision. Under engineering supervision, conductor ampacities shall be permitted to be calculated by means of the following general formula:

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where:

TC = conductor temperature in °C

TA = ambient temperature in °C

TD = dielectric loss temperature rise

RDC = dc resistance of conductor at temperature TC

YC = component ac resistance resulting from skin effect and proximity effect

RCA = effective thermal resistance between conductor and surrounding ambient

FPN: See Annex B for examples of formula applications.

Table 310.61 Conductor Application and Insulation

Trade Name Provision	Type Letter Insulation	Maximum Outer Covering	Operating Tempera- ture	Applica- tion
Medium voltage solid dielectric locations rated 2001 volts and higher	MV-90 MV-105*	90°C 105°C	Dry or wet Thermoplastic or thermosetting	Jacket, sheath, or armor

*Where design conditions require maximum conductor temperatures above 90°C.

Table 310.62 Thickness of Insulation for 601- to 2000-Volt Nonshielded Types RHH and RHW

Conductor Size (AWG or kcmil)	Column A1			Column B2	
	mm	mils	mm	mils	
14–10	2.03	80	1.52	60	
8	2.03	80	1.78	70	
6–2	2.41	95	1.78	70	
1–2/0	2.79	110	2.29	90	
3/0–4/0	2.79	110	2.29	90	
213–500	3.18	125	2.67	105	
501–1000	3.56	140	3.05	120	

1Column A insulations are limited to natural, SBR, and butyl rubbers.

2Column B insulations are materials such as cross-linked polyethylene, ethylene propylene rubber, and composites thereof.

Table 310.63 Thickness of Insulation and Jacket for Nonshielded Solid Dielectric Insulated Conductors Rated 2001 to 8000 Volts

Conductor

Size

(AWG

or kcmil)

2001–5000 Volts

Dry Locations, Single Conductor

Wet or Dry Locations

5001–8000 Volts 100 Percent Insulation Level Wet or Dry

Locations

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	Without Jacket Insulation				With Jacket				Single Conductor			
	Multi-conductor Insulation*				Single Conductor				Multi-conductor Insulation*			
	Insulation mm	Insulation mils	Jacket mm	Jacket mils	Insulation mm	Insulation mils	Jacket mm	Jacket mils	Insulation mm	Insulation mils	Jacket mm	Jacket mils
	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils	mm	mils
8	2.79	110	2.29	90	0.76	30	3.18	125	2.03	80	2.03	80
	2.03	80	2.29	90	4.57	180						
	4.57	180										
6	2.79	110	2.29	90	0.76	30	3.18	125	2.03	80	2.03	80
	2.03	80	2.29	90	4.57	180						
	4.57	180										
4-2	2.79	110	2.29	90	1.14	45	3.18	125	2.03	80	2.41	95
	2.03	80	2.29	90	4.57	180						
	4.57	180										
1-2/0	2.79	110	2.29	90	1.14	45	3.18	125	2.03	80	2.41	95
	2.03	80	2.29	90	4.57	180						
	4.57	180										
3/0-4/0	2.79	110	2.29	90	1.65	65	3.18		2.41	95		
	125	2.41	95	2.29	90	4.57	180					
	2.79	110	4.57	180								
213-500	3.05	120	2.29	90	1.65	65	3.56		140	2.79	110	5.33
	2.79	110	5.33	210	2.29	90	210		2.79	110		
	140	2.79	110	210								
501-750	3.30	130	2.29	90	1.65	65	3.94		155	3.18	125	5.97
	3.18	125	5.97	235	2.29	90	235		155	3.18	125	235
	155	3.18	125	235								
751-1000	3.30	130	2.29	90	1.65	65	3.94		3.56	140	6.35	250
	155	3.18	125	2.29	90	6.35	250		3.56	140	6.35	250
	3.56	140	6.35	250								

*Under a common overall covering such as a jacket, sheath, or armor.

Table 310.64 Thickness of Insulation for Shielded Solid Dielectric Insulated Conductors Rated 2001 to 35,000 Volts

Table 310.67 Ampacities of Insulated Single Copper Conductor Cables Triplexed in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor
Size

(AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)
2001-5000 Volts Ampacity	5001-35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105

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8	65	74	—	—
6	90	99	100	110
4	120	130	130	140
2	160	175	170	195
1	185	205	195	225
1/0	215	240	225	255
2/0	250	275	260	295
3/0	290	320	300	340
4/0	335	375	345	390
250	375	415	380	430
350	465	515	470	525
500	580	645	580	650
750	750	835	730	820
1000	880	980	850	950

Table 310.68 Ampacities of Insulated Single Aluminum Conductor Cables Tripleplexed in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)			
2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity			
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	
8	50	57	—	—
6	70	77	75	84
4	90	100	100	110
2	125	135	130	150
1	145	160	150	175
1/0	170	185	175	200
2/0	195	215	200	230
3/0	225	250	230	265
4/0	265	290	270	305
250	295	325	300	335
350	365	405	370	415
500	460	510	460	515
750	600	665	590	660
1000	715	800	700	780

Table 310.69 Ampacities of Insulated Single Copper Conductor Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

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Conductor Size (AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)					
2001–5000 Volts Ampacity	5001–15,000 Volts Ampacity					
15,001–35,000 Volts Ampacity						
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105			90°C (194°F)		
Type MV-90	105°C (221°F) Type MV-105			90°C (194°F) Type MV-90		
105°C (221°F) Type MV-105						
8 83 93	—	—	—	—	—	—
6 110 120	110	125	—	—	—	—
4 145 160	150	165	—	—	—	—
2 190 215	195	215	—	—	—	—
1 225 250	225	250	225	250	—	—
1/0 260 290	260	290	260	290	—	—
2/0 300 330	300	335	300	330	—	—
3/0 345 385	345	385	345	380	—	—
4/0 400 445	400	445	395	445	—	—
250 445 495	445	495	440	490	—	—
350 550 615	550	610	545	605	—	—
500 695 775	685	765	680	755	—	—
750 900 1000	885	990	870	970	—	—
1000 1075 1200	1060	1185	1040	1160	—	—
1250 1230 1370	1210	1350	1185	1320	—	—
1500 1365 1525	1345	1500	1315	1465	—	—
1750 1495 1665	1470	1640	1430	1595	—	—
2000 1605 1790	1575	1755	1535	1710	—	—

Table 310.70 Ampacities of Insulated Single Aluminum Conductor Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)					
2001–5000 Volts Ampacity	5001–15,000 Volts Ampacity					
15,001–35,000 Volts Ampacity						
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105			90°C (194°F)		
Type MV-90	105°C (221°F) Type MV-105			90°C (194°F) Type MV-90		
105°C (221°F) Type MV-105						
8 64 71	—	—	—	—	—	—
6 85 95	87	97	—	—	—	—
4 115 125	115	130	—	—	—	—
2 150 165	150	170	—	—	—	—
1 175 195	175	195	175	195	—	—

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1/0	200	225	200	225	200	225
2/0	230	260	235	260	230	260
3/0	270	300	270	300	270	300
4/0	310	350	310	350	310	345
250	345	385	345	385	345	380
350	430	480	430	480	430	475
500	545	605	535	600	530	590
750	710	790	700	780	685	765
1000	855	950	840	940	825	920
1250	980	1095	970	1080	950	1055
1500	1105	1230	1085	1215	1060	1180
1750	1215	1355	1195	1335	1165	1300
2000	1320	1475	1295	1445	1265	1410

Table 310.71 Ampacities of an Insulated Three-Conductor Copper Cable Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)	
	2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F)
Type MV-90	105°C (221°F) Type MV-105	
8	59	66
6	79	88
4	105	115
2	140	154
1	160	180
1/0	185	205
2/0	215	240
3/0	250	280
4/0	285	320
250	320	355
350	395	440
500	485	545
750	615	685
1000	705	790
		770
		860

Table 310.72 Ampacities of an Insulated Three-Conductor Aluminum Cable Isolated in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor Size

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(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

90°C (194°F) Type MV-90 105°C (221°F) Type MV-105 90°C (194°F)

Type MV-90 105°C (221°F) Type MV-105

8	46	51	—	—
6	61	68	72	80
4	81	90	95	105
2	110	120	125	145
1	125	140	145	165
1/0	145	160	170	185
2/0	170	185	190	215
3/0	195	215	220	245
4/0	225	250	255	285
250	250	280	280	315
350	310	345	345	385
500	385	430	425	475
750	495	550	540	600
1000	585	650	635	705

Table 310.73 Ampacities of an Insulated Triplexed or Three Single-Conductor Copper Cables in Isolated Conduit in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor

Size

(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

90°C (194°F) Type MV-90 105°C (221°F) Type MV-105 90°C (194°F)

Type MV-90 105°C (221°F) Type MV-105

8	55	61	—	—
6	75	84	83	93
4	97	110	110	120
2	130	145	150	165
1	155	175	170	190
1/0	180	200	195	215
2/0	205	225	225	255
3/0	240	270	260	290
4/0	280	305	295	330
250	315	355	330	365
350	385	430	395	440
500	475	530	480	535

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750	600	665	585	655
1000	690	770	675	755

Table 310.74 Ampacities of an Insulated Triplexed or Three Single-Conductor Aluminum Cables in Isolated Conduit in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor Size (AWG or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
Type MV-90	Type MV-105

90°C (194°F)

8	43	48	—	—
6	58	65	65	72
4	76	85	84	94
2	100	115	115	130
1	120	135	130	150
1/0	140	155	150	170
2/0	160	175	175	200
3/0	190	210	200	225
4/0	215	240	230	260
250	250	280	255	290
350	305	340	310	350
500	380	425	385	430
750	490	545	485	540
1000	580	645	565	640

Table 310.75 Ampacities of an Insulated Three-Conductor Copper Cable in Isolated Conduit in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor
Size
(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
Type MV-90	Type MV-105

90°C (194°F)

8	52	58	—	—
6	69	77	83	92
4	91	100	105	120
2	125	135	145	165
1	140	155	165	185

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1/0	165	185	195	215
2/0	190	210	220	245
3/0	220	245	250	280
4/0	255	285	290	320
250	280	315	315	350
350	350	390	385	430
500	425	475	470	525
750	525	585	570	635
1000	590	660	650	725

Table 310.76 Ampacities of an Insulated Three-Conductor Aluminum Cable in Isolated Conduit in Air Based on Conductor Temperatures of 90°C (194°F) and 105°C (221°F) and Ambient Air Temperature of 40°C (104°F)

Conductor

Size

(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

90°C (194°F) Type MV-90 105°C (221°F) Type MV-105

90°C (194°F)

Type MV-90 105°C (221°F) Type MV-105

8	41	46	—	—
6	53	59	64	71
4	71	79	84	94
2	96	105	115	125
1	110	125	130	145
1/0	130	145	150	170
2/0	150	165	170	190
3/0	170	190	195	220
4/0	200	225	225	255
250	220	245	250	280
350	275	305	305	340
500	340	380	380	425
750	430	480	470	520
1000	505	560	550	615

Table 310.77 Ampacities of Three Single-Insulated Copper Conductors in Underground Electrical Ducts (Three Conductors per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Conductor

Size

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(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

90°C (194°F) Type MV-90 105°C (221°F) Type MV-105

90°C (194°F)

Type MV-90 105°C (221°F) Type MV-105

One Circuit (See Figure 310.60, Detail 1.)

8	64	69	—	—
6	85	92	90	97
4	110	120	115	125
2	145	155	155	165
1	170	180	175	185
1/0	195	210	200	215
2/0	220	235	230	245
3/0	250	270	260	275
4/0	290	310	295	315
250	320	345	325	345
350	385	415	390	415
500	470	505	465	500
750	585	630	565	610
1000	670	720	640	690

Three Circuits (See Figure 310.60, Detail 2.)

8	56	60	—	—
6	73	79	77	83
4	95	100	99	105
2	125	130	130	135
1	140	150	145	155
1/0	160	175	165	175
2/0	185	195	185	200
3/0	210	225	210	225
4/0	235	255	240	255
250	260	280	260	280
350	315	335	310	330
500	375	405	370	395
750	460	495	440	475
1000	525	565	495	535

Six Circuits (See Figure 310.60, Detail 3.)

8	48	52	—	—
6	62	67	64	68
4	80	86	82	88
2	105	110	105	115
1	115	125	120	125
1/0	135	145	135	145
2/0	150	160	150	165
3/0	170	185	170	185
4/0	195	210	190	205

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250	210	225	210	225
350	250	270	245	265
500	300	325	290	310
750	365	395	350	375
1000	410	445	390	415

Table 310.78 Ampacities of Three Single-Insulated Aluminum Conductors in Underground Electrical Ducts (Three Conductors per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Conductor Size (AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)	
	2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F)
Type MV-90	105°C (221°F) Type MV-105	

One Circuit (See Figure 310.60, Detail 1.)

8	50	54	—	—
6	66	71	70	75
4	86	93	91	98
2	115	125	120	130
1	130	140	135	145
1/0	150	160	155	165
2/0	170	185	175	190
3/0	195	210	200	215
4/0	225	245	230	245
250	250	270	250	270
350	305	325	305	330
500	370	400	370	400
750	470	505	455	490
1000	545	590	525	565

Three Circuits (See Figure 310.60, Detail 2.)

8	44	47	—	—
6	57	61	60	65
4	74	80	77	83
2	96	105	100	105
1	110	120	110	120
1/0	125	135	125	140
2/0	145	155	145	155
3/0	160	175	165	175
4/0	185	200	185	200

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250	205	220	200	220
350	245	265	245	260
500	295	320	290	315
750	370	395	355	385
1000	425	460	405	440

Six Circuits (See Figure 310.60, Detail 3.)

8	38	41	—	—
6	48	52	50	54
4	62	67	64	69
2	80	86	80	88
1	91	98	90	99
1/0	105	110	105	110
2/0	115	125	115	125
3/0	135	145	130	145
4/0	150	165	150	160
250	165	180	165	175
350	195	210	195	210
500	240	255	230	250
750	290	315	280	305
1000	335	360	320	345

Table 310.79 Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering (Three-Conductor Cable) in Underground Electrical Ducts (One Cable per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°C)

Conductor
Size

(AWG or kcmil)	Temperature Rating of Conductor (See Table 310.61.)		
2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity		
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F)	
Type MV-90	105°C (221°F) Type MV-105		

One Circuit (See Figure 310.60, Detail 1.)

8	59	64	—	—
6	78	84	88	95
4	100	110	115	125
2	135	145	150	160
1	155	165	170	185
1/0	175	190	195	210
2/0	200	220	220	235
3/0	230	250	250	270
4/0	265	285	285	305
250	290	315	310	335

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350	355	380	375	400
500	430	460	450	485
750	530	570	545	585
1000	600	645	615	660

Three Circuits (See Figure 310.60, Detail 2.)

8	53	57	—	—
6	69	74	75	81
4	89	96	97	105
2	115	125	125	135
1	135	145	140	155
1/0	150	165	160	175
2/0	170	185	185	195
3/0	195	210	205	220
4/0	225	240	230	250
250	245	265	255	270
350	295	315	305	325
500	355	380	360	385
750	430	465	430	465
1000	485	520	485	515

Six Circuits (See Figure 310.60, Detail 3.)

8	46	50	—	—
6	60	65	63	68
4	77	83	81	87
2	98	105	105	110
1	110	120	115	125
1/0	125	135	130	145
2/0	145	155	150	160
3/0	165	175	170	180
4/0	185	200	190	200
250	200	220	205	220
350	240	270	245	275
500	290	310	290	305
750	350	375	340	365
1000	390	420	380	405

Table 310.80 Ampacities of Three Insulated Aluminum Conductors Cabled Within an Overall Covering (Three-Conductor Cable) in Underground Electrical Ducts (One Cable per Electrical Duct) Based on Ambient Earth Temperature of 20°C (68°F), Electrical Duct Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°C)

Conductor
Size

(AWG or kcmil) Temperature Rating of Conductor (See Table 310.61.)
2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

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90°C (194°F) Type MV-90 105°C (221°F) Type MV-105
Type MV-90 105°C (221°F) Type MV-105

90°C (194°F)

One Circuit (See Figure 310.60, Detail 1.)

8	46	50	—	—
6	61	66	69	74
4	80	86	89	96
2	105	110	115	125
1	120	130	135	145
1/0	140	150	150	165
2/0	160	170	170	185
3/0	180	195	195	210
4/0	205	220	220	240
250	230	245	245	265
350	280	310	295	315
500	340	365	355	385
750	425	460	440	475
1000	495	535	510	545

Three Circuits (See Figure 310.60, Detail 2.)

8	41	44	—	—
6	54	58	59	64
4	70	75	75	81
2	90	97	100	105
1	105	110	110	120
1/0	120	125	125	135
2/0	135	145	140	155
3/0	155	165	160	175
4/0	175	185	180	195
250	190	205	200	215
350	230	250	240	255
500	280	300	285	305
750	345	375	350	375
1000	400	430	400	430

Six Circuits (See Figure 310.60, Detail 3.)

8	36	39	—	—
6	46	50	49	53
4	60	65	63	68
2	77	83	80	86
1	87	94	90	98
1/0	99	105	105	110
2/0	110	120	115	125
3/0	130	140	130	140
4/0	145	155	150	160
250	160	170	160	170
350	190	205	190	205
500	230	245	230	245

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750	280	305	275	295
1000	320	345	315	335

Table 310.81 Ampacities of Single Insulated Copper Conductors Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°C)

Conductor

Size

(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
Type MV-90	90°C (194°F)
105°C (221°F) Type MV-105	

One Circuit, Three Conductors (See Figure 310.60, Detail 9.)

8	110	115	—	—
6	140	150	130	140
4	180	195	170	180
2	230	250	210	225
1	260	280	240	260
1/0	295	320	275	295
2/0	335	365	310	335
3/0	385	415	355	380
4/0	435	465	405	435
250	470	510	440	475
350	570	615	535	575
500	690	745	650	700
750	845	910	805	865
1000	980	1055	930	1005

Two Circuits, Six Conductors (See Figure 310.60, Detail 10.)

8	100	110	—	—
6	130	140	120	130
4	165	180	160	170
2	215	230	195	210
1	240	260	225	240
1/0	275	295	255	275
2/0	310	335	290	315
3/0	355	380	330	355
4/0	400	430	375	405
250	435	470	410	440
350	520	560	495	530

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500	630	680	600	645
750	775	835	740	795
1000	890	960	855	920

Table 310.82 Ampacities of Single Insulated Aluminum Conductors Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Conductor Size (AWG) or kcmil)	Temperature Rating of Conductor (See Table 310.61)			
	2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity	90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
90°C (194°F) Type MV-90				90°C (194°F) Type MV-105
Type MV-90	105°C (221°F) Type MV-105			

One Circuit, Three Conductors (See Figure 310.60, Detail 9.)

8	85	90	—	—
6	110	115	100	110
4	140	150	130	140
2	180	195	165	175
1	205	220	185	200
1/0	230	250	215	230
2/0	265	285	245	260
3/0	300	320	275	295
4/0	340	365	315	340
250	370	395	345	370
350	445	480	415	450
500	540	580	510	545
750	665	720	635	680
1000	780	840	740	795

Two Circuits, Six Conductors (See Figure 310.60, Detail 10.)

8	80	85	—	—
6	100	110	95	100
4	130	140	125	130
2	165	180	155	165
1	190	200	175	190
1/0	215	230	200	215
2/0	245	260	225	245
3/0	275	295	255	275
4/0	310	335	290	315
250	340	365	320	345

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350	410	440	385	415
500	495	530	470	505
750	610	655	580	625
1000	710	765	680	730

Table 310.83 Ampacities of Three Insulated Copper Conductors Cabled Within an Overall Covering (Three-Conductor Cable), Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Conductor

Size

(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity 5001–35,000 Volts Ampacity

90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F)
Type MV-90	105°C (221°F) Type MV-105	

One Circuit (See Figure 310.60, Detail 5.)

8	85	89	—	—
6	105	115	115	120
4	135	150	145	155
2	180	190	185	200
1	200	215	210	225
1/0	230	245	240	255
2/0	260	280	270	290
3/0	295	320	305	330
4/0	335	360	350	375
250	365	395	380	410
350	440	475	460	495
500	530	570	550	590
750	650	700	665	720
1000	730	785	750	810

Two Circuits (See Figure 310.60, Detail 10.)

8	80	84	—	—
6	100	105	105	115
4	130	140	135	145
2	165	180	170	185
1	185	200	195	210
1/0	215	230	220	235
2/0	240	260	250	270
3/0	275	295	280	305
4/0	310	335	320	345
250	340	365	350	375
350	410	440	420	450

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500	490	525	500	535
750	595	640	605	650
1000	665	715	675	730

Table 310.84 Ampacities of Three Insulated Aluminum Conductors Cabled Within an Overall Covering (Three-Conductor Cable), Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures of 90°C (194°F) and 105°C (221°F)

Conductor Size (AWG) or kcmil)	Temperature Rating of Conductor (See Table 310.61.)	
	2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105	90°C (194°F)
Type MV-90	105°C (221°F) Type MV-105	

One Circuit (See Figure 310.60, Detail 5.)

8	65	70	—	—
6	80	88	90	95
4	105	115	115	125
2	140	150	145	155
1	155	170	165	175
1/0	180	190	185	200
2/0	205	220	210	225
3/0	230	250	240	260
4/0	260	280	270	295
250	285	310	300	320
350	345	375	360	390
500	420	450	435	470
750	520	560	540	580
1000	600	650	620	665

Two Circuits (See Figure 310.60, Detail 6.)

8	60	66	—	—
6	75	83	80	95
4	100	110	105	115
2	130	140	135	145
1	145	155	150	165
1/0	165	180	170	185
2/0	190	205	195	210
3/0	215	230	220	240
4/0	245	260	250	270
250	265	285	275	295
350	320	345	330	355
500	385	415	395	425

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750	480	515	485	525
1000	550	590	560	600

Table 310.85 Ampacities of Three Triplexed Single Insulated Copper Conductors Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures 90°C (194°F) and 105°C (221°F)

Conductor

Size

(AWG

or kcmil) Temperature Rating of Conductor (See Table 310.61.)

2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity
90°C (194°F) Type MV-90	105°C (221°F) Type MV-105
Type MV-90	105°C (221°F) Type MV-105

90°C (194°F)

One Circuit, Three Conductors (See Figure 310.60, Detail 7.)

8	90	95	—	—
6	120	130	115	120
4	150	165	150	160
2	195	205	190	205
1	225	240	215	230
1/0	255	270	245	260
2/0	290	310	275	295
3/0	330	360	315	340
4/0	375	405	360	385
250	410	445	390	410
350	490	580	470	505
500	590	635	565	605
750	725	780	685	740
1000	825	885	770	830

Two Circuits, Six Conductors (See Figure 310.60, Detail 8.)

8	85	90	—	—
6	110	115	105	115
4	140	150	140	150
2	180	195	175	190
1	205	220	200	215
1/0	235	250	225	240
2/0	265	285	255	275
3/0	300	320	290	315
4/0	340	365	325	350
250	370	395	355	380
350	445	480	425	455

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500	535	575	510	545
750	650	700	615	660
1000	740	795	690	745

Table 310.86 Ampacities of Three Triplexed Single Insulated Aluminum Conductors Directly Buried in Earth Based on Ambient Earth Temperature of 20°C (68°F), Arrangement per Figure 310.60, 100 Percent Load Factor, Thermal Resistance (RHO) of 90, Conductor Temperatures 90°C (194°F) and 105°C (221°F)

Conductor Size (AWG) or kcmil)	Temperature Rating of Conductor (See Table 310.61.)	
2001–5000 Volts Ampacity	5001–35,000 Volts Ampacity	
90°C (194°F)		
Type MV-90 105°C (221°F)		
Type MV-105 90°C (194°F)		
Type MV-90 105°C (221°F)		
Type MV-105		

One Circuit, Three Conductors (See Figure 310.60, Detail 7.)

8	70	75	—	—
6	90	100	90	95
4	120	130	115	125
2	155	165	145	155
1	175	190	165	175
1/0	200	210	190	205
2/0	225	240	215	230
3/0	255	275	245	265
4/0	290	310	280	305
250	320	350	305	325
350	385	420	370	400
500	465	500	445	480
750	580	625	550	590
1000	670	725	635	680

Two Circuits, Six Conductors (See Figure 310.60, Detail 8.)

8	65	70	—	—
6	85	95	85	90
4	110	120	105	115
2	140	150	135	145
1	160	170	155	170

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1/0	180	195	175	190
2/0	205	220	200	215
3/0	235	250	225	245
4/0	265	285	255	275
250	290	310	280	300
350	350	375	335	360
500	420	455	405	435
750	520	560	485	525
1000	600	645	565	605

Disclaimer:

There may be other ways to comply with the Code. If so, you are not required to use this method to comply with the Code. You may want to investigate other options, or consult with a design professional identifying an equally code compliant solution.

End Notes

National Electrical Code

National Electrical Code Committee and National Fire Protection Association Inc.

Anaheim, CA August 2, 2001